

STORMWATER TREATMENT AREA NO. 3 & 4
PLAN FORMULATION

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2. BASIC REQUIREMENTS

2.1 GENERAL

Stormwater Treatment Area 3 & 4 (STA-3/4) is intended to improve the quality of waters discharged to the Everglades Protection Area from the S-7/S-2 and S-8/S-3 basins.

Nominally, those discharges include all those flows which would, in the absence of STA-3/4, be discharged to WCA-2A via the North New River Canal at existing Pumping Station S-7, and to WCA-3A via existing Pumping Station S-8.

The design of STA-3/4 as discussed herein is further intended to achieve, at a minimum, the interim goal established in the Everglades Forever Act for total phosphorus in those discharges (e.g., a long-term, flow-weighted mean TP concentration of 50 ppb). It is the District's intent to maximize the performance of STA-3/4 in reducing total phosphorus concentrations, within schedule constraints imposed by the Everglades Forever Act (completion of STA-3/4 is required no later than October 1, 2003) and in recognition of funding constraints.

The Everglades Forever Act also establishes mechanisms and time lines for establishment of long-term numeric standards for total phosphorus concentrations in discharges to the EPA, which will supercede the above interim goal of 50 ppb. That final standard (or standards) is not presently known, but can be expected to be substantively below 50ppb; in the event the statutory time line for establishing that standard is not met, the EFA imposes a long-term standard of 10 ppb.

Appropriate technologies for achieving that level of phosphorus reduction have not yet been developed to the point that they are capable of incorporation in the current design of STA-3/4. Substantial and extensive research and development of those advanced technologies is now in progress. Final results are not scheduled to be available until 2001. In order to meet the EFA deadline for completion of STA-3/4, it will be necessary that the design be completed and construction underway in advance of a final

determination of the most appropriate Advanced Technology for inclusion with STA-3/4. It is therefore anticipated that the addition of Advanced Technology as may be necessary to achieve the final phosphorus criterion will occur following the design and substantial completion of STA-3/4. The EFA requires conformance to the final standard no later than December 31, 2006. Modification of STA-3/4 and related works as may be necessary to meet that final phosphorus criterion is generally referred to herein as Phase 2 of the Everglades Construction Project.

Part 12 of this *Plan Formulation* document presents a summary of the current status of research now underway to further define appropriate Advanced Technology, and an assessment of the degree of flexibility for incorporation of those technologies afforded by the final design configuration of STA-3/4.

The Everglades Forever Act also requires that the District “continue research seeking to optimize the design and operation of STAs...” (Sec. 2(4)(d)(7)). To date, that research has focused primarily on treatment performance in the prototypical Everglades Nutrient Removal Project (ENRP). Additional discussion on observations resulting from operation of the ENRP and the degree to which appropriate “lessons learned” can be carried forward in the design of STA-3/4 are also presented in Part 12 of this document.

The basic footprint of STA-3/4 and definition of basic requirements for controlling inflow and outflow works was established in the September 20, 1999 *Alternatives Analysis* prepared for the District by Burns & McDonnell. That *Alternatives Analysis* was prepared in support of the District’s federal permitting requirements. It includes a reexamination of the design parameters used, including among other factors:

- Inflow volumes and phosphorus loads
- STA footprint
- Distribution of outflows
- Nutrient removal performance
- Canal conveyance

- Flexibility for incorporation of Advanced Technology under Phase 2 of the overall program mandated by the Everglades Forever Act.

2.2 SUMMARY OF RECOMMENDATIONS FROM THE *ALTERNATIVES ANALYSIS*

The following recommendations for the overall design of STA-3/4 are excerpted from the September 20, 1999 *Alternatives Analysis* for STA-3/4 and the East WCA-3A Hydropattern Restoration. In that document, prepared for the District by Burns & McDonnell, it was recommended that:

- A single (combined) stormwater treatment area providing an effective treatment area of 16,660 acres be constructed to serve the Miami Canal and North New River basins. That treatment area (STA-3/4) should be located immediately north of the L-5 system, extending generally between the Holey Land Wildlife Management Area and U.S. Highway 27 (which parallels the westerly bank of the North New River Canal).
- The basic “footprint” of STA-3/4 should be established consistent with that presented in the original *Conceptual Design*, modified to exclude the Toe of the Boot. In essence, this moves the north line of STA-3/4 north of the north line presented in the *Conceptual Design*. The District, as a result of the Talisman Land Exchange, now has title to all necessary lands south of a line 5/6-mile north of the north line shown in the *Conceptual Design*; it is presently anticipated that the necessary treatment acreage can be developed within that limitation. It should be noted that the resultant footprint of STA-3/4 does vary from that presented in the 1996 *General Design Memorandum*.
- Inflow works (inflow pumping stations G-370 and G-372; supply canals to and from those stations; and diversion structures G-371 and G-373) for STA-3/4 should be generally as described in the *General Design Memorandum*, with the following exceptions:

1. The nominal capacity of G-370 (new inflow pumping station on the North New River Canal) should be increased to 2,170 cfs.
 2. The nominal capacity of G-372 (new inflow pumping station on the Miami Canal) should be increased to 3,670 cfs.
 3. The general location of G-370 should be modified to reflect the adjusted north line of STA-3/4 recommended herein.
- Existing Pumping Station S-7 should be utilized as an outflow pumping station serving STA-3/4, up to its nominal capacity of 2,490 cfs. Some modification of the station may be necessary for that purpose.
 - A new discharge canal should be constructed along the south line of STA-3/4 immediately north of the FPL right-of-way along L-5, connecting to L-5 at each end (e.g., immediately west of U.S. Highway 27 and near the southeast corner of the Toe of the Boot).
 - Structures through South Levee L-5 (or full or partial degradation of South L-5) necessary to permit the development of sheetflow discharges to WCA-3A should be delayed until such time as discharges from STA-3/4 comply with the (as yet undefined) final phosphorus criterion for such discharges.
 - The L-5 Borrow Canal west of the southeast corner of the Toe of the Boot should be enlarged to the extent necessary to permit the transfer of STA-3/4 discharges exceeding the capacity of S-7 to the location of existing Pumping Station S-8 and G-404, both of which should be operated as outflow pumping stations serving STA-3/4.
 - Sufficient space should be reserved in the immediate vicinity of the southwest corner of STA-3/4 to permit the eventual construction of:

1. A new outflow pumping station (nominal capacity presently anticipated to be on the order of 3,350 cfs).
 2. An Advanced Treatment facility.
- Control structures G-380 and G-387 (gated structures recommended in the *General Design Memorandum* at either end of the L-5 Borrow Canal intended to control stages in L-5) should be deferred until such time as discharges from STA-3/4 fully comply with the final phosphorus criterion and sheetflow discharge to WCA-3A is permitted.
 - Wetland cell inflow and outflow control structures should be automated and capable of remote control via the District's telemetry system.
 - Existing agricultural canals aligned transverse to the primary flow direction in any given wetland cell should not be degraded unless demonstrated as a result of detailed analysis to adversely impact treatment area hydraulics.

2.2.1 Average Annual Inflow Volumes and Loads for Sizing Effective Treatment Area

In the *Alternatives Analysis*, it was recommended that inflow volumes and TP loads to be used for the detailed design of STA-3/4:

- Not consider the physical and operational changes recommended as Alternative D13R of the *Restudy*; the design should be based on the physical system and regulatory environments as they can be expected to exist upon completion of STA-3/4.
- Do not consider a level of EAA BMP performance in TP load reduction beyond that which is required by rule (e.g., 25% reduction computed in accordance with Chapter 40E-63, FAC for the EAA as a whole).

- Reflect the current operation of the C&SF Project in the EAA relative to adherence to the intent of the Lake Okeechobee IAP (e.g., anticipate a higher proportion of total EAA runoff directed to the south than was experienced in 1979-1988).
- Assign volumetric reductions in EAA runoff due to implementation of BMPs at the maximum permitted under Chapter 40E63 (e.g., 20% reduction for the EAA as a whole).
- Include Lake Okeechobee regulatory releases, with estimates of the associated volumes and TP loads based on simulations to determine the extent to which such releases can be delivered to the south through the EAA with current canal conveyance capacities and under the proposed WSE schedule.

In summary, it was recommended in the *Alternatives Analysis* that computation of the required size of STA-3/4 should be based on inflow volumes and loads presented in Table 2.1, which couples the EAA runoff (computed by methods consistent with those employed in the *Conceptual Design*) with the increased Lake releases for the period 1965-1995.

Table 2.1
Recommended Inflows for Sizing STA-3/4
 (All Volume and Load Values in 1,000s)

Estimated Inflows to STA-3/4	Unit	S-7/S-2 Basin	S-8/S-3 Basin	Both Combined
EAA Runoff				
Ave. Annual Discharge Vol.	Ac-Ft	190.5	196.4	386.9
Ave. Annual TP Load	Kg	27.4	42.7	70.1
Mean TP Concentration	Ppb	117	176	147
SSDD & SFCD				
Ave. Annual Discharge Vol.	Ac-Ft		21.1	21.1
Ave. Annual TP Load	Kg		3.2	3.2
Mean TP Concentration	Ppb		123	123
C-139 Basin at G-136				
Ave. Annual Discharge Vol.	Ac-Ft		12.2	12.2
Ave. Annual TP Load	Kg		0.8	0.8
Mean TP Concentration	Ppb		53	53
BMP Makeup Water				
Ave. Annual Discharge Vol.	Ac-Ft	50.1	65.4	115.5
Ave. Annual TP Load	Kg	4.8	5.2	10.0
Mean TP Concentration	Ppb	78	64	70
Lake Regulatory Releases				
Ave. Annual Discharge Vol.	Ac-Ft	47.6	57.7	105.3
Ave. Annual TP Load	Kg	4.6	4.6	9.1
Mean TP Concentration	Ppb	78	64	70
Total Estimated Inflows				
Ave. Annual Discharge Vol.	Ac-Ft	288.2	352.8	641.0
Ave. Annual TP Load	Kg	36.8	56.4	93.2
Mean TP Concentration	Ppb	104	130	118

Consistent with the intent defined in the *Conceptual Design*, it was not recommended that the overall size of STA-3/4 be increased to accommodate BMP Makeup Water and associated TP loads. The effective treatment area to be provided in STA-3/4 was established at 16,660 acres for consistency with the proposed *Modified Settlement Agreement*.

Section 7 of this *Plan Formulation* presents the results of detailed hydrologic modeling of STA-3/4 utilizing as basic input data the results of the District's February 1999 simulations for the period 1965-1995 for a 20% volumetric reduction in EAA runoff due to the implementation of BMPs, developed in general accord with the above-listed basic recommendations. Summaries of that data are presented in Section 5 of this *Plan Formulation*.

2.2.2 Nominal Capacities of New Inflow Pumping Stations

As noted earlier, it was recommended in the *Alternatives Analysis* that:

1. The nominal capacity of G-370 (new inflow pumping station on the North New River Canal) should be established at 2,170 cfs.
2. The nominal capacity of G-372 (new inflow pumping station on the Miami Canal) should be established at 3,670 cfs.

The combined capacity of inflow pumping stations for STA-3/4 is then 5,840 cfs, 340 cfs greater than that considered in the *General Design Memorandum*.

2.3 HYDRAULIC AND HYDROLOGIC DESIGN CRITERIA

The following paragraphs summarize limiting hydraulic and hydrologic design criteria for STA-3/4. STA-3/4 is required to accommodate without bypass all discharges from the S-8/S-3 and S-7/S-2 basins given a repetition of the hydrologic conditions experienced during the period of water years 1979-1988. Bypass can be considered during more extreme hydrologic conditions than were experienced over that period, but should be minimized or prevented if practicable in order to maximize the overall treatment performance of the system.

Target hydropatterns in the interior of the treatment area are based on criteria presented in the February 15, 1994 *Conceptual Design* prepared for SFWMD by Burns & McDonnell. It is intended that operation of the stormwater treatment area conform to the following depth criteria, all measured from the most representative ground surface elevation in any given cell.

- Minimum depth of 0.5 feet.
- Maximum depth of 4.5 feet.
- Mean (time-weighted) depth of approximately 2.0 feet.

The purpose of the minimum depth is to prevent the release of stored phosphorus during rewetting of the treatment area after dry-out. It is intended that supplemental water supply releases from Lake Okeechobee to STA-3/4 be made as necessary for the maintenance of minimum stages. It is presently anticipated that establishment of a static pool depth (e.g., normally maintained stage) of roughly 1.25 feet above the representative grade elevation in any given cell will result in a mean depth closely approximating the target of 2.0 feet while minimizing the need for supplemental Lake releases.